DOCUMENT RESUME

ED 252 357 RC 015 115

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TITLE What Does the Impact Statement Say About Economic Impacts? Coping With Growth.
INSTITUTION Oregon State Univ., Corvallis. Cooperative Extension Service.; Western Rural Development Center, Corvallis, Oreg.
REPORT NO WREP-31
PUB DATE Apr 80
NOTE 9p.; For related documents, see ED 225 754-755 and RC 015 106-117.
AVAILABLE FROM Western Rural Development Center, Oregon State University, Corvallis, OR 97331 ($.25 ea. or $4.25 for 14-part series).
PUB TYPE Guides - Non-Classroom Use (055)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Business; *Coping; *Decision Making; Economic Development; Economic Factors; Employment; *Evaluation Methods; Income; Investment; Leaders Guides; Local Issues; *Population Growth; *Predictive Measurement; Resource Materials
IDENTIFIERS Economic Growth; *Economic Impact; Estimation; *Impact Statements; Multiplier Effect; Spending Patterns

ABSTRACT

Local public officials may be confronted with the use of economic multipliers when asked to react to project proposals, to environmental impact statements, or to other studies containing economic impact analyses. Employment, income, and output multipliers are tools for estimating private sector economic impacts of a new development within a local economy. These tools provide no final answers--and in fact may generate more questions than answers. The concepts presented in this guide will help determine which economic impacts are actually analyzed, and to question and evaluate the assumptions on which a study's projections are based. Key questions are listed for employment, income and payrolls, sales and output, and new investment. A methodology section addresses kinds of multipliers (employment, household income/earnings, output/business), estimation techniques, evaluating multipliers, leakage and local consumption, and structure of the local economy. The conclusion section offers some precautions about using multipliers: estimates are sometimes exaggerated; size of the multiplier should not be the sole evaluation criteria; an aggregate multiplier may not apply equally to all service sectors; and multipliers indicate nothing about the profitability of the proposed enterprise. (BRR)

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ED252357

What Does the Impact Statement Say About Economic Impacts?

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RC015115

Mining, industrial expansion, and energy facility construction affect the private sector of a community's economy. Such projects require new investment in plant facilities and lead to increased local employment, income, and sales. In addition, the new economic activity often stimulates local business. Commercial activities and residential housing expand to serve the new population.

Local public officials and concerned citizens must carefully evaluate the economic impact information presented to them regarding a proposed development.

Private sector economic impacts should be estimated in any impact assessment. Examples of economic information often found in impact statements are presented here, along with some questions that might be asked of the impact analyst. Tools used by economists to assess private sector economic impacts are also introduced, followed by some criteria for evaluating the information presented in economic impact studies.

Private sector economic impacts are of interest to various groups of people—and may benefit some more than others. New job opportunities are welcomed by workers, but may cause concern for existing employers because of higher wage levels. The purchasing power of the new industry and its employees is attractive to local business people and outside investors. Increased housing demand means more business for local realtors, building contractors, and property owners. But it also means higher rents for people in the community—including those on fixed incomes.

New investment generates increased property and sales tax revenue. This is of interest to local public officials concerned about meeting increased demands for services.

Promoters of a particular economic development will strongly emphasize the new jobs, increased payrolls, expanded sales, and new investments. These factors form a very persuasive argument when public officials are asked to make a zoning change, grant a variance, or allow a tax concession.

Many people are affected by the private sector economic impacts of a new mining or industrial activity, and careful assessment of these impacts is essential. Accurate information about changes in

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employment, income, and sales is needed to anticipate related changes—in population, housing, school enrollment, capacity of public facilities, and demand for public services. And social stress related to community growth is even more difficult to quantify than economic or fiscal impacts.

Data on private sector employment, income, sales, and new investment provide a necessary base for estimating related changes so that entrepreneurs, public officials, and concerned citizens can respond to rapid community growth in an informed manner.

Public officials need to consider such economic impacts when evaluating an environmental impact statement (EIS). This document accompanies a request for official action relating to a proposed development. The EIS may contain some information about economic impacts in its socioeconomic section, although sometimes economic impacts are not even mentioned in the EIS. Rarely will all categories of economic impacts—employment, income, sales, and new investment—be addressed in the EIS.

Examples of Economic Impact Data

The quality of information given in an EIS can be variable. The following examples were extracted from actual impact reports.

Example: Valley Resort Expansion

The *assessed valuation* of property in the county can be expected to rise considerably as a result of the Valley Resort expansion, though the amount of the increase is impossible to estimate at this time. The county may benefit from increased *sales tax revenues*.

Employment projections are necessarily sketchy, but it can be expected that the jobs available will increase in the same occupational categories that now exist in the Valley. At present there are less than 50 people employed in the Valley. At full employment, there will be jobs created for at least 500.

The resort example is particularly vague in its estimates of increased investment (reflected by assessed valuation) and increased sales (indicated by sales tax revenues). No basis is given for the employment estimates, nor does the report indicate whether the numbers cited represent people employed directly by the resort or the total employment in the area.

Example: Subdivision Project

Jobs related to the project will be derived from construction activity for subdivision improvements and residential dwellings. Over the two-year construction period proposed, it is estimated that the project will provide the equivalent of 15 *full-time job slots* and an *annual payroll* of $375,000.

A precise estimate of employment and payroll associated with a subdivision project is provided in this EIS. However, the report does not mention the assumptions on which these estimates were based, nor whether these are direct impacts or total impacts.

Example: Factory X

As a new basic* industry in the area, Factory X, as a source of employment, would sell much of its product to markets outside of its location. Therefore, its operations employees would represent an increase in basic employment within the region. New nonbasic* employment associated with the proposed development would be persons employed by firms or industries within the area that supply Factory X with production-process goods and services, plus additional employees in wholesale/retail trade, services, and local government sectors.

Factory X's assessment of 450 basic jobs creating 900 nonbasic jobs, with a total employment growth of 1,350, may be high because the current level of nonbasic employment in County A is part of an existing trade/service/governmental system serving a multicounty area with a population of 30,000 to 35,000 or more. A substantial proportion of any new jobs will be filled by residents of this area, whose trade, service, and governmental 'needs' are already fulfilled by the area's existing system.

The Department of Ecology has developed an alternative assessment of total employment impacts, based on the 1972 Washington State Input-Output Model. This analysis suggests that an increase of 450 basic jobs would generate 225 nonbasic jobs, for a total employment impact of approximately 675 within the region.

Employment impact projections by Factory X and the Department of Ecology.

	Factory X	DOE
New Basic (Export) Employment during plant operation	450	450
hired locally or commuting	300	300
in-migrating new household heads	150	150
New Nonbasic (Service) Employment	900	225
hired locally or commuting	675	169
in-migrating new household heads	225	56
Total New Employment	1,350	675
total hired locally or commuting	975	469
total in-migrating new household heads	375	206

The EIS for Factory X provides some information about employment, but leaves many other questions unanswered. More information is needed about changes in payrolls, sales, and new investment.

* The terms basic (export) and nonbasic (service) are discussed in the **Methodology** section.

Some Key Questions

Listed below are questions that should be considered when evaluating information about private sector impacts of a new development. If the proposed new economic activity is being justified on the basis of economic benefits—new jobs, payrolls, sales, and investment—local officials need reasonable answers to these questions to make informed public decisions concerning the development.

Employment

How many people will be directly employed by the new export activity during the construction phase?

.....What kinds of construction workers will be needed?

.....How many of each kind?

.....Will these be full-time employees or seasonal workers?

.....When will they begin work?

.....How long will they be employed?

How many people will be directly employed by the plant during the operations phase?

.....What kinds of workers will be needed?

.....How many of each kind of worker?

.....When will they begin work?

.....If seasonal workers will be employed, will the timing complement or compete with existing local seasonal employment?

.....How many of these new export (basic) workers are likely to be hired from within the local community?

.....Will these be people currently unemployed or employees drawn away from other jobs? Will such vacancies be filled with new employees, or will job functions be consolidated?

.....How many of the new export workers are likely to commute from other communities?

.....How many are likely to migrate into the community and become new residents?

.....How many people might migrate into the community in hopes of obtaining a job, and possibly add to the community's unemployment rolls?

How many new service (nonbasic) jobs are projected as a result of the new export activity?

.....How many workers are likely to be hired from within the local community?

.....Will these be people currently unemployed, or employees drawn away from existing jobs?

.....How many new service workers are likely to commute from neighboring communities?

.....How many are likely to migrate into the local community and become residents?

Income and Payrolls

What is the anticipated annual payroll of the new export activity during the construction phase and during the plant operation phase?

....How will the payroll be distributed (by type of worker)?

.....How much is likely to go to workers hired from within the local community?

.....How much is the income loss from previous jobs not refilled in the community?

.....How much of the new payroll will go to commuters living outside the local community (who tend to spend their income where they live)?

.....How much of the new payroll will be spent locally—rather than outside the community in neighboring trade centers?

How much additional service payroll will be generated in local businesses?

Sales and Output

What types of sales are expected by the new export activity?

.....What is the expected annual volume of each type of sales?

What are predicted types of purchases from local support businesses by the new export activity?

.....What is the expected annual volume of each type of purchase from the local business sector?

What are predicted types of purchases from local support businesses by the new workers at the export activity?

.....What is the expected annual volume of each type of purchase from the local business sector?

Will these local purchases by the new export activity and its employees be made from existing businesses or from new businesses (opened perhaps by outside investors)?

New Investment

How much new capital investment is planned by the new export activity?

How much new investment in expanded commercial facilities can be expected by service businesses?

How much new housing investment is likely by new employees or existing residents with increased incomes?

In some cases, the State Environmental Policy Act (SEPA) does not require including an economic impact analysis in an EIS. Why, then, should these kinds of questions be considered in the analysis of a new project proposal?

Usually, a new export activity directly employs new workers; it may also stimulate increased indirect employment in support/service businesses. In order to predict how much new population will be drawn in by the project, it is necessary to estimate how many of these new workers will be new heads of households migrating into the community.

Informed estimates of new population are important for determining the increased school enrollment. Demand for new housing also depends on new population, as well as on the increased income of existing residents.

Reasonable estimates of future demand on public facilities and services also depend on population and housing projections. Expansion of public facilities and services, and when it can occur, depends on increased tax revenue. Increased tax revenue is generated from assessed valuation of new investment and from increased sales in the community.

Social impacts of a proposed project are difficult to predict without accurate estimates of:

- new population likely to migrate into the community due to the new employment
- the level of new income generated
- the community's financial ability to provide additional public services and facilities demanded by the new population.

Careful attention to private sector changes in employment, income, sales, and new investment will provide a reasonable base for predicting indirect impacts from a new project. Changes in population, housing, public facilities and services, and fiscal and social impacts must all be anticipated by a community preparing for growth.

Methodology

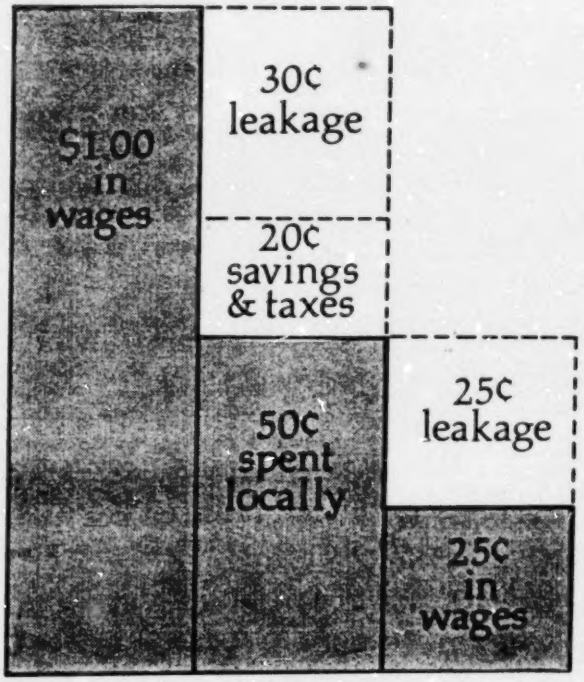
How do economists assess the private sector economic impacts of a new development?

The **economic multiplier** is one tool that is often used. Multipliers are based on the interdependency between two types of business sectors in the local economy—the export (or basic) and service (or nonbasic) sectors.

Export activities produce goods and services for sale outside the local economy (exports). By selling exports, these activities bring new dollars into the local economy, providing fuel for growth. Some export activities in nonmetropolitan areas are agriculture, mining, manufacturing, tourism, and construction of large-scale projects such as dams or electrical generating plants. By selling outside the local economy, these export sectors are considered "prime movers" of the local economy.

Other business activities that sell goods and services to residents or other businesses within the local economy make up the nonexport (or nonbasic) service sectors. These generally include such service-oriented businesses as retail grocery and clothing stores, auto and machinery repair shops, banks, accountants, and doctors. By selling their goods and services within the local economy, the service activities circulate within the local economy the new dollars brought in by the export sectors.

An expansion in sales generally has a multiplier effect such that total change in income for the local economy is greater than the dollar volume of the initial expansion alone. An additional increment of output by an industry producing goods for export outside the local economy, for example, will require additional inputs. Firms and individuals supplying the additional inputs to the exporting industry will, in turn, increase purchases from their suppliers. This process continues through successive rounds of expenditures. Likewise, this cumulative effect can be illustrated by tracing one dollar in wages spent by a new worker at the plant. Assume that the worker spends 50¢ locally, and 30¢ outside the local economy, with the remaining 20¢ being used for savings and income taxes. The local merchants receive 50¢ and use 25¢ to purchase goods from suppliers outside the community. The remaining 25¢ is spent locally for wages, utilities, and purchases from other businesses. In this example, the initial 50¢ spent locally by the worker generates another 25¢ of local income the first time it is respent. This process repeats itself over and over again.



The multiplier concept of local respending patterns.

Multipliers are an easy way to estimate the sum of all the spending and respending without adding up each individual transaction.

Kinds of Multipliers

As described above, the multiplier is the numerical relationship between an original change in economic activity and the ultimate change in activity that results as the money is spent and respent through various sectors of the economy. There are several kinds of multipliers used to assess private sector economic impacts of new export activity, including employment multipliers, income multipliers, and output multipliers.

An **employment multiplier** is the total change in full-time equivalent employment (F.T.E.) generated in the local economy for each change of one F.T.E. in an export sector of the local economy. (Note that one F.T.E. can be a full-time job, or it can be two or three part-time positions with total hours worked equaling one man-year.) In the EIS example, Factory X used an employment multiplier of 3.0 to estimate that 450 new export jobs would generate a total of 1,350 new jobs in the local economy. In contrast, the Department of Ecology used a more conserva-

tive multiplier of 1.5 to estimate that the same 450 new export jobs would generate a total of only 675 new jobs in the same local economy. (Some possible reasons for this variation from 3.0 to 1.5 are discussed in the **Evaluating Multipliers** section.) Both totals include the initial 450 new export jobs.

A **household income (or earnings) multiplier** is the total change in household income throughout the local economy from a one dollar change in household income payments by an export sector. For example, if the household income multiplier for mining firms in the local economy was 2.5, each initial $1.00 increase in the mining firm's payments to households would generate another $1.50 increase in other household incomes, making a total of $2.50 in increased payments to households throughout the local economy.

An **output (or business) multiplier** is the total change in sales generated throughout the local economy by a $1.00 change in export sales of a particular sector.

Estimation Techniques

Techniques for estimating economic multipliers range from guessing or using rules of thumb to sophisticated econometric models. Two of the most commonly used tools are the export base approach and the input-output model. In both approaches, the local economy is divided into separate business sectors.

The export base approach uses a two-sector export and service model such as that described at the beginning of the **Methodology** section. An input-output model further disaggregates export and service activities into separate sectors, and an accounting is prepared of what each of the sectors buy and sell from every other sector. From either approach, it is possible to derive multipliers that estimate the changes in the economy caused by an increase or decrease in sales of any particular sector of the local economy.*

However, an input-output model is costly to assemble, since it may require an extensive survey to compile the data necessary for its computation. Furthermore, the predicted input-output relationship may not hold true over time. Thus, a forcast made on the basis of a multisector input-output model may be no better than a forecast based on the two-sector export base model.

Export base multipliers have the advantage of being quicker and easier to use. They are also less expensive to compute than input-output models and have minimal data requirements. Since the export base approach generates a single aggregate multiplier, its accuracy for specific economic sectors is far less than that of the input-output model—but it is generally acceptable for most situations in smaller, more rural economies.

* Input-output multipliers can be calculated two different ways. The Type I method does not include the household sector in the calculation. By assuming that once a dollar reaches the household sector, it leaks from the economy, Type I multipliers tend to understate the total impact. The Type II method does include household interactions with the economy. Type II multipliers are applied more often in economic impact analysis.

Evaluating Multipliers

It was noted in the previous section that two different employment multipliers—3.0 and 1.5—were estimated by Factory X and the DOE. The two multipliers resulted in differing estimates of total employment impacts of 1,350 and 675 new jobs to be generated from 450 new export jobs. What factors might account for the difference in the multipliers that were calculated? How might one judge what size multiplier is more reasonable?

The essential test of accuracy for a multiplier is how closely it reflects the actual economic relationships in the economy under consideration.

Due to the cost of conducting an export base study or developing a local input-output model, analysts often borrow multipliers that were not developed specifically from local data. Such multipliers are overlaid onto the area on the assumption that the multiplier will adequately reflect the relationships in the local economy. An example would be the use of a multiplier for the mining sector in Big Horn County, Wyoming, to estimate impacts of new mining activity in Ferry County, Washington. Alternatively, a multiplier from the mining sector in the state input-output model may be stepped down to the local economy.

Such borrowing practices can save money and time, and produce acceptable results when used appropriately. However, there are many instances in which an economy is so unique that overlaying will not produce accurate results. In evaluating whether an overlay or stepped-down multiplier has been used appropriately, it is important to consider whether economic interdependencies in the two areas are similar or significantly different.

According to Gordon and Mulkey, the size of the community income multiplier is directly related to two variables:

(1) the propensity of households to consume locally, and

(2) the total (direct, indirect, and induced) income in the local economy resulting from each dollar spent in local consumption.

In other words, the larger the proportion of income spent locally and the larger the propensity for local expenditures to generate income in the local economy, the larger will be the income multiplier.

Several factors related to these two variables are useful in examining the comparability of the economy for which a multiplier was estimated and the local economy to which it is to be applied.

Leakage and Local Consumption

Leakage is a drain on the local economy as households spend part of their income elsewhere. Other things being equal, the propensity to consume locally is expected to be relatively higher (and leakage relatively lower):

- in a larger community that has a more diverse economy;
- in a community located a substantial distance from competitive shopping centers; and
- in a community where financial institutions are local-economy-oriented.

Population size and economic diversity can influence multiplier size. A larger, more diverse area generally has a greater variety of businesses; thus, more of a given dollar is apt to be spent locally before leaking than would be the case in a smaller area. A multiplier for a county will be smaller than that for a multicounty area, which in turn, will be smaller than the multiplier for a statewide economy.

A multiplier is also affected by the local economy's geographic location and accessibility of major trade centers. The total income generated by a new export activity could be reduced drastically if a large proportion of the new payroll is being spent outside the local economy. Money spent by local residents for purchases in stores outside the local community is leakage because it is not likely to get circulated back into the local economy. Thus, areas near trade centers (with the trade center located outside the local economy) have smaller multipliers due to leakage than do similar areas that contain their own major trade centers. The latter situation keeps more of each dollar in the local economy for more rounds of spending.

Another form of leakage is the importing of raw materials for local processing or manufacturing. Consider two areas with similar new manufacturing plants; where one can buy raw materials locally, the other must import those materials. If a community is able to provide the goods and services required by both the workers and the plant, the multiplier will be much greater than it would be if some or all of those goods and services were purchased from outside the local economy.

Structure of the Local Economy

The amount of income generated in the local economy per actual dollar spent locally will vary with the structure of each economy.

Different sectors of the local economy, for example, have different backward linkages to other sectors of the local economy. Backward linkages refer to the inputs purchased. If one new plant purchases primarily labor, then its impact is likely different from another new development which makes relatively large purchases of utilities, transportation, etc., along with labor. In some cases, a particular new manufacturing industry may create a greatly expanded demand for specific locally produced goods and services.

A multiplier for a particular sector, such as mining, might also vary from one community to another due to differences in excess capacity in the local economic structure. Local retail business establishments operating with excess capacity could absorb considerable new business before needing to add more salespersons or expand their facilities. In such cases, the income multiplier would likely be higher than the employment multiplier. On the other hand, if such businesses were already operating at full capacity, increased sales would likely create new jobs and payrolls in operating the additional business activity and in construction of expanded facilities to handle the increased sales, thus contributing to higher employment and income multipliers.

Another case where the income multiplier could be higher than the associated employment multiplier is when a local labor market with excess capacity can provide a large portion of the needed work force. If a labor market with excess capacity included enough unemployed (or underemployed) workers to meet the needs of a new mining operation, for example, then few new workers would be drawn in from outside the local economy. And if very little of the needed work force were available from within an economy having no excess capacity, then a sizeable percentage of the new workers would be drawn into the community, but perhaps as commuters rather than as new residents. A relatively higher income multiplier should result from new payrolls to local workers being spent locally than from those same payrolls going to commuters spending most of their income outside the local economy.

Another issue is whether an average multiplier or a marginal multiplier has been determined. The average income multiplier is typically presented as the ratio of total income to export income at a point in time. The marginal income multiplier, on the other hand, is the *change* in total income divided by the *change* in export income over a period of time. There may be substantial differences in the value of these two multiplier estimates due to changes in the relative importance of particular export sectors over time.

Accuracy of a multiplier depends on how well it reflects the actual economic relationships in a particular local economy. Since those actual relationships are difficult and costly to determine, it is difficult to judge which size multiplier might be more reasonable. Rather than choosing a specific multiplier, an appropriate course might be to display the employment impacts of using a range of multipliers. This recognizes the difficulty in obtaining an exact estimate of the multiplier, yet allows the community to anticipate the impacts of the high and low estimates of changes in economic activity. One probable range of aggregate multiplier values is shown in the following table for each county employment size class.

Average multiplier values and ranges by county employment size classes.

County employment size-class	Average multiplier	Probable range*
1,000 - 2,999	1.7	1.5 - 1.9
3,000 - 4,999	1.8	1.5 - 2.0
5,000 - 9,999	1.9	1.6 - 2.1
10,000 - 19,999	2.0	1.8 - 2.2
20,000 - 49,999	2.2	2.0 - 2.4
50,000 and over	2.2	2.0 - 2.5

* Based on data for 375 Appalachian counties, there is a probability of 70 percent, or 7 chances in 10, that individual county multipliers will be included within these ranges.

Source: Gadsby, Dwight M. "Current Procedures Used in Evaluating Resource, Conservation and Development Projects." *Secondary Impacts of Public Investment in Natural Resources*, Misc. Publ. 1177, Economic Research Service, U.S. Department of Agriculture, Washington, D.C., 1968.

Conclusion

Some Precautions

Estimates of income and employment multipliers are sometimes greatly exaggerated. Gordon and Mulkey argue that an aggregate community income multiplier of over 2.5 should be critically evaluated, and should not be accepted for impact analyses without a convincing explanation of why it is so large. Individual sector income multipliers, such as agriculture and manufacturing, may be larger than 2.5, however.

The size of the multiplier should not be the sole criterion used in evaluating a new economic activity. For example, a hot dog stand may have a high multiplier, and pulp plant a much lower one. One should also consider the amount of initial employment, income, etc. brought in by the new activity, which along with the multiplier effect, influences the total economic impact within the local economy. One hundred new workers in a sector with a multiplier of 1.1 would have ten times the impact of two new workers in another sector with a multiplier of 5.5.

An aggregate multiplier may not apply equally to all service sectors in the local economy. It should be noted that some types of service businesses may experience higher income impacts from each $100 of new construction payroll than other business sectors do. Similarly, within a given sector—retail business, for example—that increased local business might go to existing business establishments or to a possible new shopping center opened up by outside investors.

Multipliers indicate nothing about the profitability of the proposed export enterprise. Decisions for or against a particular development must take into account the financial viability of the enterprises comprising it—and economic multipliers cannot provide this kind of prediction.

Summary

Employment, income, and output multipliers are tools for estimating private sector economic impacts of a new development within a local economy. These tools provide no final answers—and in fact may generate more questions than answers. However, local public officials may be confronted with the use of economic multipliers when asked to react to project proposals, to environmental impact statements, or to other studies containing economic impact analyses. The concepts presented in this publication will help in determining which economic impacts are actually analyzed, and to question and evaluate the assumptions on which the study's projections are based.

For Further Information

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The author appreciates the review and comments of Lee Blakeslee, Walt Butcher, Ken Duft, and Ralph Loomis of Washington State University, Neil Meyer of University of Idaho, and Garnet Premer of University of Wyoming. This publication is part of the "Coping with Growth" series produced by the Western Rural Development Center. Other titles in the series include:

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